and teacher: Use this cover sheet for mailing or faxing.

ASSIGNMENT BOOKLET
SCN2261 Physics 20
Module 7 Assignment

FOR STUDENT USE ONLY	
Date Assignment Submitted: _____	(If label is missing or incorrect) Student File Number: _____
Time Spent on Assignment: _____	Module Number: _____

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_____
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Physics 20

Learn veryWare

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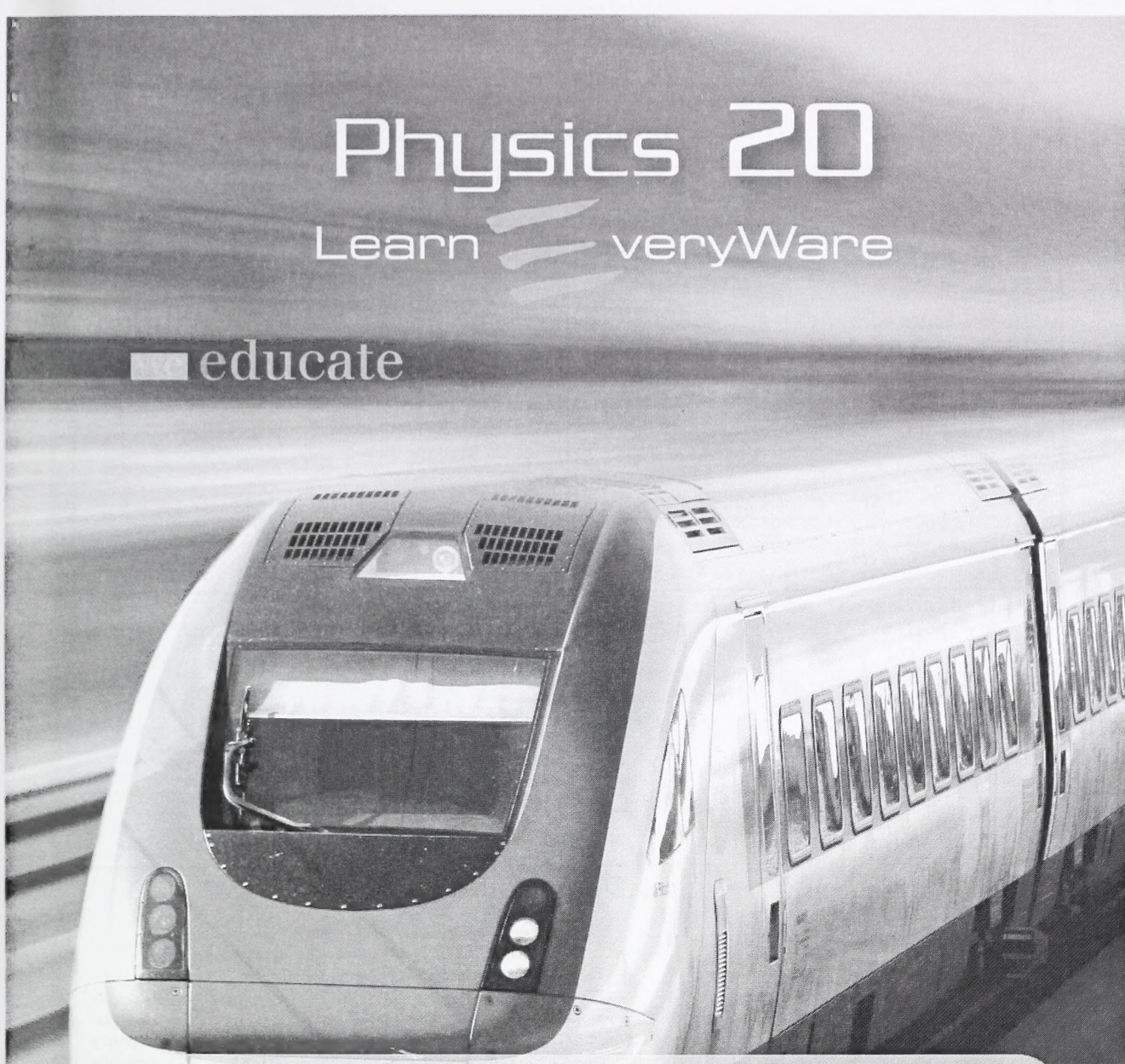

Module 7

OSCILLATORY MOTION

ASSIGNMENT BOOKLET

ABCDEFG
1234567
ROCKY VIEW SCHOOL DIVISION

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Calgary Board of Education

Alberta Education

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 1 Assignment	29	
Lesson 2 Assignment	24	
Lesson 3 Assignment	19	

Teacher's Comments

Physics 20
Module 7: Oscillatory Motion
Assignment Booklet
ISBN 978-0-7741-3017-2

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This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**
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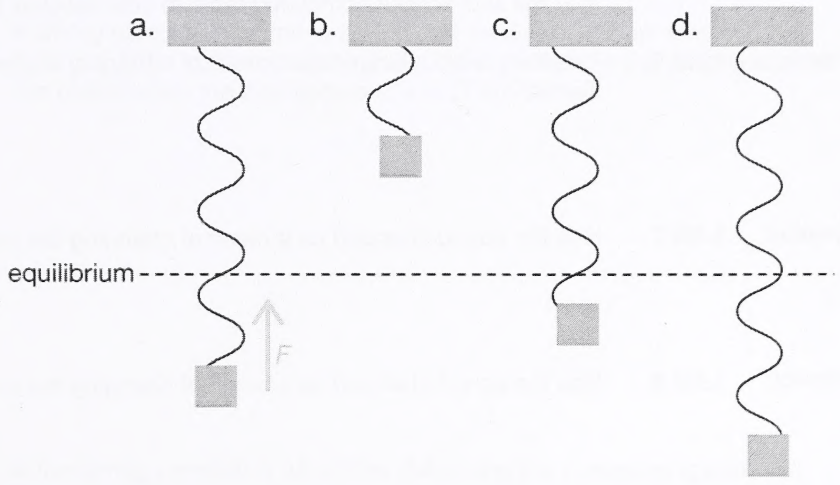
MODULE 7: LESSON 1 ASSIGNMENT

This Module 7: Lesson 1 Assignment is worth 29 marks. The value of each assignment and each question is stated in the left margin.

(29 marks) Lesson 1 Assignment: Simple Harmonic Motion of a Weighted Spring

(3 marks) TR 1.

To set up the simulation, click on the "Vectors" button (vector) and choose "acceleration at origin" on the popup menu. If the "Selected Vectors" popup menu does not display "acceleration at origin", drag the green bar at the top of the popup upwards till all the choices are visible. Then click on the "Components" button (Components) to show the acceleration vector. Now press "Play," and observe the motion of the weighted spring and the corresponding acceleration vector. The acceleration vector is proportional in magnitude to the restoring force by Newton's second law ($F = ma$). Based on your observations, draw the restoring force on each of the images below. The first one has been completed as an example.



(1 mark) **LAB 1.** In the Period Measurements table, record the time for ten cycles in the simulation. The time required to complete one cycle is the period of the weighted spring. Calculate the period from the data for ten cycles. Record the data under the column heading "With Default Settings."

PERIOD MEASUREMENTS

Number of Cycles	Time to Complete (Seconds)			
	With Default Settings	With Modified Amplitude of Release	With Modified Mass	With Modified Spring Constant
10				
1				

(2 marks) **LAB 5.** Find the average time for the completion of one cycle for each of the previous steps of the procedure. (You do this by dividing the time for ten cycles by 10.) Place your results in the appropriate cells in the Period Measurements table. You will submit your completed table to your teacher for marks.

(1 mark) **LAB 6.** Has the period changed as a result of changing the amplitude of release? Explain.

(2 marks) **LAB 7.** Has the period changed as a result of changing the mass? Explain.

(2 marks) **LAB 8.** Has the period changed as a result of changing the spring constant? Explain.

(3 marks) **LAB 9.** Summarize your findings from LAB 6, LAB 7, and LAB 8 by listing the parameters that *do* affect the period of the weighted spring and the ones that *do not* have an effect.

(1 mark) **TR 2.** a. How many rotations does the reference circle make for every complete wave ( ) drawn on the graph?

(2 marks) b. How many complete cycles does this represent on the weighted spring? Does this mean that the period for the circular motion is identical to the period of the simple harmonic motion?

(1 mark) c. Compare the radius of the circle with the amplitude of the oscillator. How are they similar?

(3 marks) **TR 3.** a. A 250-g object hangs from a spring and oscillates with an amplitude of 5.42 cm. If the spring constant is 48.0 N/m, determine the acceleration of the object when the displacement is 4.27 cm [down].

(3 marks) b. If the spring constant is 48.0 N/m, determine the maximum speed. Tell where the maximum speed will occur.

(2 marks) **TR 4.** A 78.5-kg man is about to complete a bungee jump. If the bungee cord has a spring constant of 150 N/m, determine the period of oscillation that he will experience.

(3 marks) **TR 5.** A 5.00-kg mass oscillates on a spring with a frequency of 0.667 Hz. Calculate the spring constant.

MODULE 7: LESSON 2 ASSIGNMENT

This Module 7: Lesson 2 Assignment is worth 24 marks. The value of each assignment and each question is stated in the left margin.

(24 marks) **Lesson 2 Assignment: Simple Harmonic Motion of a Pendulum**

(1 mark) **TR 1.** Calculate the restoring force that acts on a 1.0-kg hanging mass when it is displaced 2.0° from equilibrium.

(1 mark) **TR 2.** Calculate the restoring force that acts on a 1.0-kg hanging mass when it is displaced 10° from equilibrium.

(1 mark) **TR 3.** Based on your answers from TR 1 and TR 2, what is the relationship between the magnitude of the restoring force and the angle of displacement from equilibrium?

(2 marks) **LAB 6.** Find the average time for the completion of one cycle for each of the previous steps of the procedure. (You do this by dividing the time for ten cycles by ten.) Place your results in the appropriate cells in the Period Measurements table.

PERIOD MEASUREMENTS

Number of Cycles	Time to Complete (Seconds)				
	With Default Settings	With Modified Angle of Release	With Modified Mass	With Modified Length	With Modified Acceleration Due to Gravity
10					
1					

(1 mark) **LAB 7.** Has the period changed as a result of changing the angle of release? Explain.

(1 mark) **LAB 8.** Has the period changed as a result of changing the mass? Explain.

(2 marks) **LAB 9.** Has the period changed as a result of changing the length of the pendulum? Explain.

(2 marks) **LAB 10.** Has the period changed as a result of changing the acceleration due to gravity? Explain.

(4 marks) **LAB 11.** Summarize your findings from LAB 7 to 10 by listing the parameters that *do* affect the period of the pendulum and the ones that *do not* have an effect.

(2 marks) **TR 4.** Calculate the period of a 1.50-m pendulum. Verify your answer using the simulation.

(3 marks) **TR 5.** On the hypothetical planet Xeon, a pendulum with a length of 95.0 cm swings with a frequency of 1.50 Hz. What is the acceleration due to gravity on Xeon?

(2 marks) **TR 6.** Describe one similarity and one difference between the velocity vector on the reference circle and the velocity vector on the pendulum.

(1 mark) **TR 7.** a. How many rotations does the reference circle make for every complete wave ( ) drawn on the graph?

(1 mark) b. How many complete swing cycles does this represent on the pendulum?

MODULE 7: LESSON 3 ASSIGNMENT

This Module 7: Lesson 3 Assignment is worth 19 marks. The value of each assignment and each question is stated in the left margin.

(19 marks) **Lesson 3 Assignment: Mechanical Resonance**

(1 mark) **TR 1.** The periodic push that a child exerts on the swing must match the _____ frequency of the swing.

(1 mark) **TR 2.** *Resonance* stems from the Latin noun meaning _____.

(2 marks) **TR 3.** Every oscillating system has a _____ frequency, which is determined by the _____ properties of the object.

LAB 1. Complete questions 1, 2, and 3 of "Part A" on page 384.

(2 marks) 1.

(1 mark) 2.

(1 mark) 3.

LAB 2. Complete questions 4, 5, and 6 of "Part B" on page 384.

(1 mark) 4.

(1 mark) 5.

(1 mark) 6.

(1 mark) **TR 4.** Compared to audible sound, the frequency of earthquake waves are generally _____.

(1 mark) **TR 5.** Buildings between 5 and 40 storeys high are typically _____ with earthquake waves.

(1 mark) **TR 6.** Engineers build energy _____ systems into buildings so that an earthquake will not destroy them easily.

(5 marks) **TR 7.** A 25.0-kg child in Red Deer pumps herself on a swing when she kicks upward on the downswing, thus changing the distance from the pivot point to her centre of gravity from 2.40 m to 2.28 m. What is the difference in the resonant frequency of her swing before the kick and afterwards?

Once you have completed all of the questions, submit your work to your teacher.